

COMBUSTION AND FLAME

THE JOURNAL OF THE COMBUSTION INSTITUTE

VOLUME 96

NUMBERS 1/2

JANUARY 1994

Contents

CAROLYN R. KAPLAN (Washington, DC), SEUNG W. BAEK (Taejon, Korea), ELAINE S. ORAN (Washington, DC), and JANET L. ELLZEY (Austin, TX)	
Dynamics of a Strongly Radiating Unsteady Ethylene Jet Diffusion Flame	1
J. P. H. SANDERS and A. P. G. G. LAMERS (Eindhoven, The Netherlands)	
Modeling and Calculation of Turbulent Lifted Diffusion Flames	22
D. N. KOERT, D. L. MILLER, and N. P. CERNANSKY (Philadelphia, PA)	
Experimental Studies of Propane Oxidation through the Negative Temperature Coefficient Region at 10 and 15 Atmospheres	34
TOSHIMI TAKAGI and ZHE XU (Osaka, Japan)	
Numerical Analysis of Laminar Diffusion Flames—Effects of Preferential Diffusion of Heat and Species	50
V. R. KATTA, L. P. GOSS (Dayton, OH), and W. M. ROQUEMORE (Wright-Patterson A.F.B., OH)	
Effect of Nonunity Lewis Number and Finite-Rate Chemistry on the Dynamics of a Hydrogen–Air Jet Diffusion Flame	60
C. WOLDEN, K. K. GLEASON, and J. B. HOWARD (Cambridge, MA)	
A Reduced Reaction Mechanism for Diamond Deposition Modeling	75
D. BRADLEY, Z. CHEN, S. EL-SHERIF, S. EL-DIN HABIK, G. JOHN, and G. DIXON-LEWIS (Leeds, U.K.)	
Structure of Laminar Premixed Carbon–Methane–Air Flames and Ultrafine Coal Combustion	80
P. B. SUNDERLAND, S. MORTAZAVI, G. M. FAETH (Ann Arbor, MI), and D. L. URBAN (Brook Park, OH)	
Laminar Smoke Points of Nonbuoyant Jet Diffusion Flames	97
YU.YA. BURIKO, V. R. KUZNETSOV, D. V. VOLKOV, S. A. ZAITSEV, and A. F. URYVSKY (Moscow, Russia)	
A Test of a Flamelet Model for Turbulent Nonpremixed Combustion	104
SEUNG WOOK BAEK, KOOK YOUNG AHN, and JONG UCK KIM (Taejon, Korea)	
Ignition and Explosion of Carbon Particle Clouds in a Confined Geometry	121
NICKOLAY N. SMIRNOV and MICHAEL V. TYURNIKOV (Moscow, Russia)	
A Study of Deflagration and Detonation in Multiphase Hydrocarbon–Air Mixtures	130
A. D. BAER, L. M. VANOS, and N. W. RYAN (Salt Lake City, UT)	
Combustion Wave Propagation in Activated-Carbon Beds for Oxygen Containing Gases at Low Velocities	141

continued on next page

continued from previous page

M. COSTA, S. GODOY, F. C. LOCKWOOD, and J. ZHOU (London, U.K.) Initial States of the Devolatilization of Pulverized-Coal in a Turbulent Jet	150
HAI WANG and MICHAEL FRENKLACH (University Park, PA) Transport Properties of Polycyclic Aromatic Hydrocarbons for Flame Modeling	163
DONG-KE ZHANG (Adelaide, Australia) Bifurcation Behavior in a Homogeneous-Heterogeneous Reaction System with a Constant Power Source	171
Brief Communication	
ELLEN MEEKS, AILI TING, JOSEPH F. GRCAR, and ROBERT J. KEE (Livermore, CA) Flame-Centered Grid Transformation for Numerical Simulation of Strained Flames	179
Comments	
W. L. H. HALLETT (Ottawa, Canada) Comment of "Ignition of Blended-Fuel Droplet in High-Temperature Atmosphere", by Takei, Tsukamoto, and Niioka	186
TAKASHI NIIOKA (Sendai, Japan) Reply to the Comment by Hallett	188

Contents

JAIDEEP MUKHERJEE, ADEL F. SAROFIM, and JOHN P. LONGWELL (Cambridge, MA) Polycyclic Aromatic Hydrocarbons from the High-Temperature Pyrolysis of Pyrene	191
R. MINETTI, M. RIBAUCOUR, M. CARLIER, C. FITTSCHEN, and L. R. SOCHET (Villeneuve d'Ascq, France) Experimental and Modeling Study of Oxidation and Autoignition of Butane at High Pressure	201
YEHUDA HAAS, YESHAYAHU BEN ELIAHU (Jerusalem, Israel), and SHMUEL WELNER (Haifa, Israel) Infrared Laser-Induced Decomposition of GAP	212
DEREK BRADLEY, P. H. GASKELL, and X. J. GU (Leeds, U.K.) Application of a Reynolds Stress, Stretched Flamelet, Mathematical Model to Computations of Turbulent Burning Velocities and Comparison with Experiments	221
JANUSZ A. KOZIŃSKI (Kraków, Poland) PACs Formation and Interaction in Semipractical Flames of Liquid Fuels	249
A. MAKINO, N. ARAKI, and Y. MIHARA (Hamamatsu, Japan) Combustion of Artificial Graphite in Stagnation Flow: Estimation of Global Kinetic Parameters from Experimental Results	261
A. COPPALLE and D. JOYEUX (Mont Saint Aignan, France) Temperature and Soot Volume Fraction in Turbulent Diffusion Flames: Measurements of Mean and Fluctuating Values	275
VALENTIN M. ASTASHINSKY, EVGENY A. KOSTYUKEVICH, OLEG A. IVASHKEVICH, ANATOLY I. LESNIKOVICH, and VASILY A. KRASITSKY (Minsk, Belarus Republic) A Study of the Phenomenon of Liquid-Flame Combustion I. Visual Examinations and High-Speed Photography	286
P. L. GARCÍA and C. TREVIÑO (Madrid, Spain) Analysis of the Thermal Diffusion Effects on the Ignition of Hydrogen-Air Mixtures in the Boundary Layer of a Hot Flat Plate	293
SHWIN-CHUNG WONG (Hsinchu, Taiwan), AR-CHENG LIN (Tao-Yuan, Taiwan), and CHUN-EE WU (Hsinchu, Taiwan) Microexplosions of Boron and Boron/Carbon Slurry Droplets	304
ATSUSHI NAKAKUKI (Abiko-Shi, Japan) Heat Transfer in Small Scale Pool Fires	311

Contents

I. SHIH TSENG and VIGOR YANG (University Park, PA)	
Combustion of a Double-Base Homogenous Propellant in a Rocket Motor	325
Y. KOHNO, K. MAEKAWA, T. TSUCHIOKA, T. HASHIZUME, and A. IMAMURA (Hiroshima, Japan)	
A Relationship Between the Impact Sensitivity and the Electronic Structures for the Unique N-N Bond in the HMX Polymorphs	343
M. D. CHECKEL (Edmonton, Canada) and ALUN THOMAS (Liverpool, U.K.)	
Turbulent Combustion of Premixed Flames in Closed Vessels	351
I. G. SHEPHERD and L. W. KOSTIUK (Berkeley, CA)	
The Burning Rate of Premixed Turbulent Flames in Divergent Flows	371
J. Y. HUH, K. Y. LEE, and I. K. PURI (Chicago, IL)	
The Structure of Nonpremixed Methyl Chloride and Methyl Chloride/Methane Air Flames Near Extinction	381
JÜRGEN WARNATZ (Stuttgart, Germany), MARK D. ALLENDORF, ROBERT J. KEE (Livermore, CA), and MICHAEL E. COLTRIN (Albuquerque, NM)	
A Model of Elementary Chemistry and Fluid Mechanics in the Combustion of Hydrogen on Platinum Surfaces	393
K. SESHADRI, N. PETERS (Aachen, Germany), and F. A. WILLIAMS (La Jolla, CA)	
Asymptotic Analyses of Stoichiometric and Lean Hydrogen-Air Flames	407
S. C. COMITIS, D. GLASSER, and B. D. YOUNG (Johannesburg, South Africa)	
An Experimental and Modeling Study of Fires in Ventilated Ducts. Part I: Liquid Fuels	428
THIERRY MANTEL (Rueil-Malmaison, France), and ROLAND BORGHI (Mont Saint-Aignan, France)	
A New Model of Premixed Wrinkled Flame Propagation Based on a Scalar Dissipation Equation	443

Contents

MAN YEONG HA and BYEONG RYUN CHOI (Pusan, Korea)	
A Numerical Study on the Combustion of a Single Carbon Particle Entrained in a Steady Flow	1
TSUNG LEO JIANG and WEI-TANG CHIANG (Tainan, Taiwan)	
Effects of Multiple Droplet Interaction on Droplet Vaporization in Subcritical and Supercritical Pressure Environments	17
D. P. MISHRA, P. J. PAUL, and H. S. MUKUNDA (Bangalore, India)	
Stretch Effects Extracted from Inwardly and Outwardly Propagating Spherical Premixed Flames	35
J. M. CARD, W. T. ASHURST (Livermore, CA), and F. A. WILLIAMS (La Jolla, CA)	
Modification of Methane-Air Nonpremixed Flamelets by Vortical Interactions	48
ISAAC I. KANTOROVICH and EZRA BAR-ZIV (Beer-Sheva, Israel)	
Processes in Highly Porous Chars under Kinetically Controlled Conditions:	
I. Evolution of the Porous Structure	61
ISAAC I. KANTOROVICH and EZRA BAR-ZIV (Beer-Sheva, Israel)	
Processes in Highly Porous Chars under Kinetically Controlled Conditions:	
II. Pore Reactivity	79
NILS A. RØKKE, JOHAN E. HUSTAD, and OTTO K. SØNJU (Trondheim, Norway)	
A Study of Partially Premixed Unconfined Propane Flames	88
JOHN C. CHEN, MASAYUKI TANIGUCHI, KIYOSHI NARATO, and KAZUYUKI ITO (Ibaraki-ken, Japan)	
Laser Ignition of Pulverized Coals	107
G. F. KRAMMER and A. F. SAROFIM (Cambridge, MA)	
Reaction of Char Nitrogen During Fluidized Bed Coal Combustion—Influence of Nitric Oxide and Oxygen on Nitrous Oxide	118

Contents

RAHUL PURI, ROBERT J. SANTORO (University Park, PA), and KERMIT C. SMYTH
(Gaithersburg, MD)

The Oxidation of Soot and Carbon Monoxide in Hydrocarbon Diffusion Flames	125
VICTOR QUAN, DREW A. COPELAND, JAY A. BLAUER, and SERGIO E. RODRIGUEZ (Canoga Park, CA)	
Singlet Oxygen Generation According to Flame-Sheet and Finite-Rate Chlorine/BHP Reaction Models	145
Y. R. SIVATHANU and J. P. GORE (West Lafayette, IN)	
Coupled Radiation and Soot Kinetics Calculations in Laminar Acetylene/Air Diffusion Flames	161
KULDEEP PRASAD (New Haven, CT)	
Interaction of Pressure Perturbations with Premixed Flames	173
T. B. HUNTER, H. WANG, T. A. LITZINGER, and M. FRENKLACH (University Park, PA)	
The Oxidation of Methane at Elevated Pressures: Experiments and Modeling	201
COLOMBA DI BLASI (Napoli, Italy)	
Processes of Flames Spreading over the Surface of Charring Fuels: Effects of the Solid Thickness	225
A. SOUFIANI (Chatenay-Malabry, France) and E. DJAVDAN (Jouy-en-Josas, France)	
A Comparison between Weighted Sum of Gray Gases and Statistical Narrow-Band Radiation Models for Combustion Applications	240

Contents

P. DUTTA, J. P. GORE, Y. R. SIVATHANU, and P. E. SOJKA (West Lafayette, IN) Global Properties of High Liquid Loading Turbulent Crude Oil + Methane/Air Spray Flames	251
R. S. BARLOW and C. D. CARTER (Livermore, CA) Raman/Rayleigh/LIF Measurements of Nitric Oxide Formation in Turbulent Hydrogen Jet Flames	261
H.-J. WEBER, A. MACK, and P. ROTH (Duisburg, Germany) Combustion and Pressure Wave Interaction in Enclosed Mixtures Initiated by Temperature Nonuniformities	281
SHIGEO KONDO, KAZUAKI TOKUHASHI, HIDEKAZU NAGAI, MASAJI IWASAKA, and MASAHIRO KAISE (Tsukuba, Japan) Experimental Study of Spontaneous Ignition Limit of Oxygen-Lean Silane Mixtures	296
D. LOZINSKI, J. BUCKMASTER (Urbana, IL), and P. RONNEY (Los Angeles, CA) Absolute Flammability Limits and Flame-Balls	301
J. K. BECHTOLD and C. K. LAW (Princeton, NJ) The Structure of Premixed Methane-Air Flames with Large Activation Energy	317
XIANGYANG DU and KALYAN ANNAMALAI (College Station, TX) The Transient Ignition of Isolated Coal Particle	339
GURDIP SINGH, I. P. S. KAPOOR, S. M. MANNAN (Gorakhpur, India), and J. P. AGRAWAL (Pune, India) Kinetics of Thermolysis of Ring-Substituted Arylammonium Nitrates 2. TG, DTA, Impact, and Friction Sensitivity Studies	355
S. P. PANDA, S. G. KULKARNI, and C. PRABHAKARAN (Pune, India) Accelerated Hypergolic Ignition with Lowering of Temperature	372
K. M. YU, C. J. SUNG, and C. K. LAW (Princeton, NJ) Some Aspects of the Freely Propagating Premixed Flame in a Spatially Periodic Flow Field	375
B. QUAY, T.-W. LEE, T. NI, and R. J. SANTORO (University Park, PA) Spatially Resolved Measurements of Soot Volume Fraction Using Laser-Induced Incandescence	384
INDREK S. WICHMAN (Chatenay-Malabry, France) On the Influence of a Fuel Side Heat-Loss ("Soot") Layer on a Planar Diffusion Flame	393
Brief Communications	
SEUNG WOOK BAEK (Taejon, Korea) Ignition of Combustible Gases by Radiative Heating of Inert Particles	418
Y. JU and T. NIIOKA (Sendai, Japan) Extinction of a Diffusion Flame in Supersonic Mixing Layer	423
A. A. EVANS (Wellington, New Zealand) Deflagrations in Spherical Vessels: A Comparison Among Four Approximate Burning Velocity Formulae	429
CHRISTINE L. MAUPIN and HAROLD H. HARRIS (St. Louis, MO) Electrical Perturbation of Cellular Premixed Propane/Air Flames	435
Volume Contents	